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			2187	

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Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/820,629

Applicant(s)

KASAKO ET AL.

Examiner

Ankur Gogia

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 32-75 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 32-75 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 April 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 1/14/05 & 5/2/05 & 6/29/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

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### **DETAILED ACTION**

1. The examiner acknowledges the preliminary amendment, dated 20 December 2004, canceling original claims 1-32 and introducing new claims 32-75. Therefore, the instant application having Application No. 10/820,629 has a total of 44 claims pending in the application; there are 2 independent claims and 42 dependent claims, all of which are ready for examination by the examiner.

### ***Oath/Declaration***

2. The Applicant's oath/declaration has been reviewed by the examiner and is found to conform to the requirements prescribed in 37 C.F.R. 1.63.

### ***Priority***

3. Acknowledgment is made of the Applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy has been filed in the instant application.

### ***Drawings***

4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 1101-1104 (Figs. 11, 13, 14); 1205 (Fig. 12); S3301, S3302, S3307, S3308, S3310, S3313, S3314 (Fig. 33); S3401, S3402, S3409-S3412 (Fig. 34); and S3701-S3703, S3709, S3710, S3712-S3716 (Fig. 37). Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the

reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the Applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

5. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference characters "1101" and "1102" have been used to designate both "primary volume" and "auxiliary volume". Further more, reference characters "1103" and "1104" have been used to designate both "primary journal" and "auxiliary journal". Specifically, in Fig. 18, it is believed that the Applicant intended for "1102" and "1104" to refer to the "auxiliary volume" and "auxiliary journal", respectively, and for "1101" and "1103" to refer to the "primary volume" and "primary journal", respectively. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by

the examiner, the Applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Information Disclosure Statement***

6. As required by M.P.E.P. 609(c), the Applicant's submission of the Information Disclosure Statements dated 14 January 2005, 2 May 2005, and 29 June 2005 are acknowledged by the examiner and the cited references, with the exception of the two "other documents" cited in the Information Disclosure Statement dated 29 June 2005, have been considered in the examination of the claims now pending. As required by M.P.E.P. 609(c)(2), copies of the PTOL-1449 initialed and dated by the examiner are attached to the instant office action. The reasoning for not considering the two "other documents" is as follows.

7. The information disclosure statement filed 29 June 2005 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to as "other documents" has not been considered.

8. The information disclosure statement filed 29 June 2005 fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 because the "other documents" are not properly cited. In addition to Title and Pertinent Pages, the Applicant must provide

Author, Date and location of Publication. It has been placed in the application file, but the information referred to as "other documents" has not been considered as to the merits. Applicant is advised that the date of any re-submission of any item of information contained in this information disclosure statement or the submission of any missing element(s) will be the date of submission for purposes of determining compliance with the requirements based on the time of filing the statement, including all certification requirements for statements under 37 CFR 1.97(e). See MPEP § 609.05(a).

### ***Specification***

9. The disclosure is objected to because of the following informalities: Page 11, Line 9 states "the second and 20", where it is believed that the Applicant intended to state "the second 20". Appropriate correction is required.

10. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which Applicant may become aware in the specification.

### ***Claim Objections***

11. Claims 33-53 and 55-75 are objected to because of the following informalities: Claims 33-53 and 55-75 recite "A storage system", however claims 32 and 54 already provide for "A storage system". It is recommended that claims 33-53 and 55-75 be

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modified to state "The storage system" to comply with the standard claim form as defined in 37 C.F.R. 1.75. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

12. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

13. Claims 38 and 60 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to be reasonably conveyed to one skilled in the relevant art, at the time the application was filed.

**Claims 38 and 60**

The claims state that the change of relationship is from being that the first logical volume does not correspond to the second logical volume, to being that the first logical volume corresponds to the second logical volume. It is unclear as to what the Applicant intended when stating that the two logical volumes do or do not correspond to each other. As it is currently stated, the claims have multiple interpretations none of which would be obvious over the other. Also, the specification lacks a description of what is meant by "correspond". Therefore, the claims fail to meet the written description requirement.

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. Claims 32-39, 41, 43, 45, 47-61, 63, 65, 67, 69-75 are rejected under 35 U.S.C. 103(a) as being obvious over LeCrone (U.S. Patent 6,529,944) in view of O'Hare et al (U.S. PGPub 2001/0050915).

**Claim 32**

LeCrone discloses a storage system comprising: a first storage device (Fig. 1, Symm2) coupled to an information processing device (Col. 7, Lines 51-53; Fig. 1, Item 02) and having a first controller and a plurality of first disk drives; said first controller controlling to store data received from said information processing device in said first disk drives and receiving a first command (Col. 8, Line 45) and being able to transfer said first command to a Nth (N = positive integer of no fewer than 3) storage device (Fig. 1, Symm6) **through** a second storage device (Fig. 1, Symm5), said first command being sent from said information processing device to said Nth storage device (Col 8, Lines 40-51); said second storage device being coupled to said first storage device (Col. 8, Lines 5-9) and being nearer to said first storage device than said Nth storage device (Col. 8, Lines 5-17) and having a second controller and a plurality of second disk drives; said second controller controlling to store data in said second disk drives and being able to receive said first command from said first storage device and being able to



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transfer said first command to said Nth storage device (Col 8, Lines 40-51); said Nth storage device being coupled to said second storage device or to a (N-1)th storage device (Fig. 1; Col. 8, Lines 11-17) and having a Nth controller and a plurality of Nth disk drives; and said Nth controller controlling to store data in said Nth disk drives and receiving said first command from said first storage device and executing said first command (Col 8, Lines 47-41).

Fig. 7a shows a typical configuration of a Symmetrix system (Col. 1, Lines 30-33). From the figure we see that the Symmetrix system consists of a plurality of disk drives (Fig. 7a, Items C1-C3; Col. 1, Lines 35-37) and controllers (Fig. 7a, Items DA1-DA3; Col. 1, Lines 33-35). Therefore, it is shown that the first, second and Nth storage devices contain a first, second and third controller and a plurality of first, second and third disk drives, respectively.

Note that as N is a variable defined to be an integer of value no less than 3, for claim 32 and the remainder of this Office Action N has been assigned the value 3.

LeCrone does not disclose expressly said first controller being able to transfer said first command to a Nth storage device without transferring said first command to a second storage device. However, O'Hare et al. disclose being able to transfer a command from a first storage device (Fig. 8, Item 112a) to an Nth storage device (Fig. 8, Item 112c) without transferring the command to a second storage device (Fig. 8, Item 112b). Paragraphs 32-34 describe the routing of commands in an embodiment as shown in Fig. 1. Paragraph 62 goes on to state that the embodiment of Fig. 8 is an alternate embodiment that can use the methods of paragraphs 32-34 to route

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commands. Therefore, referring to Fig. 8, it would be possible for system 112a to route a command to system 112c without sending the command through system 112b.

LeCrone and O'Hare et al. are analogous art because they are from the same field of endeavor of routing commands in a network of storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of LeCrone and O'Hare et al. before them, to incorporate the ability to bypass a second storage device in transferring commands from a first storage device to an Nth storage device.

The motivation for doing so would have been to "provide for an alternate and dynamic selection and specification of a communication path, for example, in the event of a component or connection failure" (O'Hare et al. Paragraph 11).

Therefore, it would have been obvious to combine O'Hare et al. with LeCrone for the benefit of routing commands in a storage system to obtain the invention as specified in claim 32.

### **Claim 33**

LeCrone discloses the storage system, wherein: said first storage device or said second storage device or said (N-1)th storage device is coupled to information of one or more storage devices (Col. 12, Lines 32-38; Fig. 16).

### **Claim 34**

LeCrone discloses the storage system, wherein said first storage device is coupled to information of one or more storage devices (Col. 12, Lines 32-38; Fig. 16);

and said first storage device transfers said first command to said Nth storage device based on said information (Col. 12, Lines 45-52; Fig. 15).

### **Claims 35-37**

LeCrone discloses the storage system, wherein: said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume as required by claim 35. He further discloses wherein said first command is used to request a change of relationship between a first logical volume and a second logical volume in a Nth storage device as required by claim 36. Also disclosed is wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume in said first storage device or said (N-1)th storage device as required by claim 37. In Col. 8, Lines 40-51, LeCrone discloses that commands from the host can be effected in any of the storage devices in the network. Figs 4a-4e depict the list of commands that can be effected in the system described by LeCrone. Since the commands shown there are all directed towards changing relationships between logical volumes of the system and the above reference to Col. 8 states that the commands can be effected at any site in the system, it would be obvious to one of ordinary skill in the art that the commands can be used to effect the changes as disclosed in claims 35-37.

### **Claim 38**

LeCrone discloses a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device (Fig. 11, Items 20am1 and 20am2) and a second logical volume (Fig. 11, Item

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30b(20am3)); said change of relationship between said first logical volume and said second logical volume is a change from a first condition to a second condition; said first condition is that said first logical volume does not correspond to said second logical volume; and said second condition is that said first logical volume corresponds to said second logical volume (Col. 6, Lines 54-67; Fig. 11).

In the described embodiment, items 20am1 and 20am2 were not mirrored to item 30b before the change (first condition) and were mirrored after the change (second condition).

As discussed above, claim 38 was rejected for failing to comply with the written description requirement of 112 first paragraph, the reason being the intended meaning of the term “correspond” was not clear. For the purpose of this art rejection, the claim is interpreted such that when the first logical volume corresponds to the second logical volume, they form a mirror such that the data of the first logical volume is copied to second logical volume.

#### **Claim 39**

LeCrone discloses, a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to form a pair (Col. 7, Lines 10-14) of said first logical volume as a primary volume (Col. 7, Line 12) and said second logical volume as a secondary volume (Col. 7, Line 13-14) storing data that corresponds to data stored in said primary volume (Col. 7, Lines 10-14).

**Claim 41**

LeCrone discloses a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of copying (Col. 6, Lines 54-65) data stored in said first logical volume as a primary volume (Col. 7, Line 12) to said second logical volume as a secondary volume (Col. 7, Line 13-14) so that data stored in said first logical volume conforms to data stored in said second logical volume.

**Claim 43**

LeCrone discloses a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of storing (Col. 6, Lines 54-65) data in relation to said first logical volume as a primary volume (Col. 7, Line 12) in said second logical volume as a secondary volume (Col. 7, Line 13-14).

**Claim 45**

LeCrone discloses a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data sent from said information processing device in said first logical volume as a primary volume and

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not to store data in relation to said first logical volume in said second logical volume as a secondary volume (Col. 7, Lines 18-35).

**Claim 47**

LeCrone and O'Hare et al. disclose a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of restoring data from said first logical volume to said second logical volume (Col. 7 Lines 28-40).

Note that in making this rejection, the examiner is taking the definition of restore to be copying changes in a first logical volume to a second logical volume (i.e. re-synchronizing the volumes) as defined in the specification of the instant application on pages 25-26.

**Claim 48**

LeCrone discloses a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of copying (Col. 6, Lines 54-65) data in relation to said first logical volume (Col. 7, Line 12) in said second logical volume (Col. 7, Line 13-14).

**Claim 49**

LeCrone discloses a storage system wherein said first controller or a (N-1)<sup>th</sup> controller transfers said first command to said N<sup>th</sup> storage device based on contents of said first command (Fig. 15; Col.12, Lines 45-67).

**Claim 50**

LeCrone discloses a storage system wherein said first controller provides a third logical volume to said information processing device, said third logical volume being used by said information processing device to control said first storage device; and said first controller transfers said first command to said second storage device based on contents of said first command sent from said information processing device to said third logical volume (Fig. 15; Col.12, Lines 45-67).

Note that although LeCrone does not disclose expressly that a third logical volume is used to control the first storage device it is inherently implied. In Col. 8, Lines 40-51, it is stated that commands can be executed by any of the storage systems in the chain of devices. For a controller on the first storage device, for instance, to execute a command from the information processing device, the command must be stored on a volume of the first storage device since a command cannot be executed without being stored in a memory. Therefore, it is inherent that the command is stored on a logical volume that is used to control the storage device as required by claim 50.

**Claim 51**

LeCrone discloses a storage system wherein said first controller provides a fourth logical volume to said information processing device, said fourth logical volume

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corresponding to a fifth logical volume in said second storage device; and said first controller transfers said first command to said fifth logical volume if said fourth logical volume is addressed in said first command sent from said information processing device (Col. 12, Lines 52-60). In the referred to embodiment, if the host is attempting to access a logical volume on a remote storage device, it can send a command addressed to a source volume. The first storage device will then interpret the request as actually addressing the remote volume that this source volume refers to. Therefore, the referred embodiment describes where a command sent to a "fourth" logical volume is transferred to a "fifth" logical volume as required by claim 51.

**Claim 52**

LeCrone discloses a storage system wherein said first command has information comprising an identification number of said Nth storage device (Col. 12, Lines 48-57).

**Claim 53**

LeCrone discloses a storage system wherein said first controller receives a second command, said second command being used to request a condition of a first logical volume from said information processing device (Col. 9, Line 66) to said Nth storage device, and said Nth controller receives said second command from said first storage device or said (N-1)th storage device and replies with a status of said first logical volume to said information processing device via said first storage device or said (N-1)th storage device in response to said second command (Col. 9, Line 66 – Col. 10, Line 5).



Since the system can transfer commands through the entire network (Col. 8, Lines 40-51), the commands are issued to the Nth device.

Since commands can only be sent through the chain, the response must be returned via the first or (N-1)th storage device.

LeCrone does not disclose expressly the storage system wherein the first controller can transfer the second command to the Nth storage device without transferring the second command to the second device. However, O'Hare et al. disclose being able to transfer a command from a first storage device (Fig. 8, Item 112a) to an Nth storage device (Fig. 8, Item 112c) without transferring the command to a second storage device (Fig. 8, Item 112b). Paragraphs 32-34 describe the routing of commands in an embodiment as shown in Fig. 1. Paragraph 62 goes on to state that the embodiment of Fig. 8 is an alternate embodiment that can use the methods of paragraphs 32-34 to route commands. Therefore, referring to Fig. 8, it would be possible for system 112a to route a command to system 112c without sending the command through system 112b.

LeCrone and O'Hare et al. are analogous art because they are from the same field of endeavor of routing commands in a network of storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of LeCrone and O'Hare et al. before them, to incorporate the ability to bypass a second storage device in transferring commands from a first storage device to an Nth storage device.

The motivation for doing so would have been to "provide for an alternate and dynamic selection and specification of a communication path, for example, in the event of a component or connection failure" (O'Hare et al. Paragraph 11).

Therefore, it would have been obvious to combine O'Hare et al. with LeCrone for the benefit of routing commands in a storage system to obtain the invention as specified in claim 53.

**Claims 54-61, 63, 65, 67, 69-75**

As stated above in the discussion of claim 32, the claims 32-39, 41, 43, 45, 47-53 contain the variable N, defined as a positive integer of no less than 3. In treating these claims in this Office Action, N has been assigned the value 3. In this case the claims 54-61, 63, 65, 67, 69-75 are of the same scope as claims 32-39, 41, 43, 45, 47-53 and therefore, are rejected for the same reasons.

16. Claims 40, 42, 44, 46, 62, 64, 66, and 68 are rejected under 35 U.S.C. 103(a) as being obvious over LeCrone in view of O'Hare et al. and further in view of Nakano et al. (U.S. PGPub 2003/0051111).

**Claim 40**

LeCrone and O'Hare et al. disclose a storage system according to claim 32 as above. They further disclose a change in relationship where the change is to form a pair between a first logical volume as a primary volume and a second logical volume as a secondary volume.

However, they do not disclose expressly wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device

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and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to form a pair of said second logical volume as a primary volume and said first logical volume as a secondary volume storing data that corresponds to data stored in said primary volume.

Nakano et al. disclose changing the relationship between two logical volumes to form a pair between the volumes such that the second logical volume is a primary volume and the first logical volume is a secondary volume (Paragraphs 87, 88 and 92). In the embodiment of Paragraphs 87, 88 and 92, the original configuration is that of Fig. 1 where a logical volume of data center 1 is paired with a logical volume of data center 2 and after a change of configuration, the data center 2 acts as the primary site and is paired with data center 1 as the secondary site.

LeCrone and Nakano et al. are analogous art because they are from the same field of endeavor of controlling remote copy methods in a network of storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of LeCrone and Nakano et al. before them, to incorporate the swapping of two logical volumes that form a pair wherein the first logical volume was a primary volume and the second logical volume a secondary volume before the swap and the first logical volume is a secondary logical volume and the second logical volume a primary volume after the swap.

The motivation for doing so would have been faster recovery of the storage system from a disaster (Paragraphs 88 and 89).

Therefore, it would have been obvious to combine Nakano et al. with LeCrone for the benefit of quicker disaster recovery time in a network of storage systems to obtain the invention as specified in claim 40.

#### **Claim 42**

LeCrone and O'Hare et al. disclose a storage system according to claim 32 as above. They further disclose a change in relationship where the change is to a state of copying data stored in a first logical volume as a primary volume to a second logical volume as a secondary volume.

However, they do not disclose expressly a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of copying data stored in said second logical volume as a primary volume to said first logical volume as a secondary volume so that data stored in said second logical volume conforms to data stored in said first logical volume.

Nakano et al. disclose changing the relationship between two logical volumes such that data stored in the second logical volume as a primary volume is copied to the first logical volume as a secondary volume (Paragraphs 87, 88 and 92). In the embodiment of Paragraphs 87, 88 and 92, the original configuration is that of Fig. 1 where data is stored in a logical volume of data center 1 as a primary volume and is copied to a logical volume of data center 2 as a secondary volume and after a change

of configuration, the data is stored in a logical volume of data center 2 as the primary volume and is copied to a logical volume of data center 1 as the secondary volume.

LeCrone and Nakano et al. are analogous art because they are from the same field of endeavor of controlling remote copy methods in a network of storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of LeCrone and Nakano et al. before them, to incorporate the swapping of two logical volumes wherein data stored in a first logical volume as a primary volume is copied to a second logical volume as a secondary volume before the swap and data stored in a second logical volume as a primary logical volume is copied to the first logical volume as a secondary volume after the swap.

The motivation for doing so would have been faster recovery of the storage system from a disaster (Paragraphs 88 and 89).

Therefore, it would have been obvious to combine Nakano et al. with LeCrone for the benefit of quicker disaster recovery time in a network of storage systems to obtain the invention as specified in claim 42.

#### **Claim 44**

LeCrone and O'Hare et al. disclose a storage system according to claim 32 as above. They further disclose a change in relationship where the change is to a state of storing data in relation to a first logical volume as a primary volume in a second logical volume as a secondary volume.

However, they do not disclose expressly a storage system wherein said first command is used to request a change of relationship between a first logical volume in a

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Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data in relation to said second logical volume as a primary volume in said first logical volume as a secondary volume.

Nakano et al. disclose changing the relationship between two logical volumes such that data stored in relation to a second logical volume as a primary volume is stored in the first logical volume as a secondary volume (Paragraphs 87, 88 and 92).

LeCrone and Nakano et al. are analogous art because they are from the same field of endeavor of controlling remote copy methods in a network of storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of LeCrone and Nakano et al. before them, to incorporate the swapping of two logical volumes wherein data stored in relation to a first logical volume as a primary volume is stored in a second logical volume as a secondary volume before the swap and data stored in relation to a second logical volume as a primary logical volume is stored in the first logical volume as a secondary volume after the swap.

The motivation for doing so would have been faster recovery of the storage system from a disaster (Paragraphs 88 and 89).

Therefore, it would have been obvious to combine Nakano et al. with LeCrone for the benefit of quicker disaster recovery time in a network of storage systems to obtain the invention as specified in claim 44.

**Claim 46**

LeCrone and O'Hare et al. disclose a storage system according to claim 32 as above. They further disclose a change in relationship where the change is to a state of storing data in a first logical volume as a primary volume and not storing data in relation to said first logical volume in a second logical volume as a secondary volume.

However, they do not disclose expressly a storage system wherein said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume; and said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data sent from said information processing device in said second logical volume as a primary volume and not to store data in relation to said second logical volume in said first logical volume as a secondary volume.

Nakano et al. disclose changing the relationship between two logical volumes such that the change swaps the operation of the two volumes (i.e. the first logical volume operates as a secondary volume and the second logical volume operates as a primary volume) (Paragraphs 87, 88 and 92).

LeCrone and Nakano et al. are analogous art because they are from the same field of endeavor of controlling remote copy methods in a network of storage devices.

At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of LeCrone and Nakano et al. before them, to incorporate the swapping of two logical volumes wherein a first logical volume operating as a primary volume before the swap operates as a secondary volume after the swap

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and a second logical volume operating as a secondary volume before the swap operates as a primary volume after the swap in a system that can split pairs of logical volumes.

The motivation for doing so would have been faster recovery of the storage system from a disaster (Paragraphs 88 and 89).

Therefore, it would have been obvious to combine Nakano et al. with LeCrone for the benefit of quicker disaster recovery time in a network of storage systems to obtain the invention as specified in claim 46.

#### **Claims 62, 64, 66, and 68**

As stated above in the discussion of claim 32, the claims 40, 42, 44 and 46 contain the variable N, defined as a positive integer of no less than 3. In treating these claims in this Office Action, N has been assigned the value 3. In this case the claims 62, 64, 66, and 68 are of the same scope as claims 40, 42, 44 and 46 and therefore, are rejected for the same reasons.

#### ***Double Patenting***

17. Copending applications 11/087,983 and 10/820,629 (instant) were found to have obviousness-type provisional double-patenting issues.

18. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).



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A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

19. Claims 37-54, 57-75 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 30-45 and 48 of copending Application No. 11/087,983 in view of O'Hare et al. (U.S. PGPub 2001/0050915).

This is a provisional obviousness-type double patenting rejection.

With respect to claim 32 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<u>Instant Application 10/820,629</u>	<u>Application 11/087,983</u>
<b>37.</b> A storage system, comprising	<b>30.</b> A storage system, comprising
A first storage device coupled to an information processing device and having a first controller and a plurality of first disk drives	A first storage device coupled to an information processing device having a first controller and a plurality of first disk drives
Said first controller controlling to store data received from said information processing device in said first disk drives and	Said first controller controlling to store data received from said information processing device in said first disk drives and
Receiving a first command and	Receiving a first command
Being able to transfer said first command to a Nth (N = positive integer of no fewer than 3) storage device without transferring said first command to a second storage device	[Obvious: see <i>Graham v. Deer</i> factors below]
Said first command being sent from said information processing device to said Nth storage device	Sent from said information processing device to a second storage device and transferring said first command to said

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	second storage device
Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume in said first storage device or said (N-1)th storage device	Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said second storage device being coupled to said first storage device and	Said second storage device coupled to said first storage device
Being nearer to said first storage device than said Nth storage device and	[Inherent by definition of hierarchical memory system]
Having a second controller and a plurality of second disk drives	Having a second controller and a plurality of second disk drives
Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume in said first storage device or said (N-1)th storage device	Said second disk drives being corresponding to a plurality of logical volumes which have said first logical volume
Said second controller controlling to store data in said second disk drives and	Said second controller controlling to store data in said second disk drives
Being able to receive said first command from said first storage device and being able to transfer said first command to said Nth storage device	[Obvious: see <i>Graham v. Deer</i> factors below]
Said Nth storage device being coupled to said second storage device or to a (N-1)th storage device and having a Nth controller and a plurality of Nth disk drives	[Obvious: see <i>Graham v. Deer</i> factors below]
Said Nth controller controlling to store data in said Nth disk drives and receiving said first command from said first storage device and executing said first command	And controlling to change said relationship between said first logical volume and said second logical volume in response to said command [Obvious: see <i>Graham v. Deer</i> factors below]

The difference between app# 11/087,983 and the instant application, is that the instant application contains a first, second, and up to an Nth storage device, where N is

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at least 3. Also, the instant application has where the command can be sent to the third device directly by bypassing the second device.

However, O'Hare et al. disclose a network of storage devices wherein the number of storage devices is greater than or equal to 3 (Fig. 8) and where a command can be transferred from a first storage device to a Nth storage device without transferring the command to a second storage device (Paragraphs 32-34). Examiner notes that in order to bypass a middle storage device, there must be at least three storage devices.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, having app# 11/087,983 and O'Hare et al. before them, to add a third up to an Nth storage device and allow for a first storage device to bypass the a second storage device in transferring commands to a Nth storage device.

The motivation for doing so would have been to "provide for an alternate and dynamic selection and specification of a communication path, for example, in the event of a component or connection failure" (O'Hare et al. Paragraph 11).

With respect to claim 38 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>38.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>31.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is a change from a first condition to	Said change of relationship between said first logical volume and said second logical volume is a change from a first status to a

a second condition	second status
Said first condition is that said first logical volume does not correspond to said second logical volume and	Said first status is that said first logical volume is not corresponding to said second logical volume and
Said second condition is that said first logical volume corresponds to said second logical volume	Said second status is that said first logical volume is corresponding to said second logical volume

With respect to claim 39 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>39.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>32.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to form a pair of said first logical volume as a primary volume and said second logical volume as a secondary volume storing data that corresponds to data stored in said primary volume	Said change of relationship between said first logical volume and said second logical volume is to form a pair of said first logical volume as being a primary volume and said second logical volume as being a secondary volume stored data which are corresponding to data stored in said primary volume

With respect to claim 40 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>40.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>33.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical	Said change of relationship between said first logical volume and said second logical

volume is to form a pair of said second logical volume as a primary volume and said first logical volume as a secondary volume storing data that corresponds to data stored in said primary volume	volume is to form a pair of said second logical volume as being a primary volume and said first logical volume as being a secondary volume stored data which are corresponding to data stored in said primary volume
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With respect to claim 41 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>41.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>34.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of copying data stored in said first logical volume as a primary volume to said second logical volume as a secondary volume so that data stored in said first logical volume conforms to data stored in said second logical volume	Said change of relationship between said first logical volume and said second logical volume is to change to a state of copying data stored in said first logical volume as a primary volume to said second logical volume as a secondary volume so that data stored in said first logical volume are conform to data stored in said second logical volume

With respect to claim 42 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>42.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>35.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of copying	Said change of relationship between said first logical volume and said second logical volume is to change to a state of copying

data stored in said second logical volume as a primary volume to said first logical volume as a secondary volume so that data stored in said second logical volume conforms to data stored in said first logical volume	data stored in said second logical volume as a primary volume to said first logical volume as a secondary volume so that data stored in said second logical volume are conform to data stored in said first logical volume
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With respect to claim 43 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>43.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>36.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data in relation to said first logical volume as a primary volume in said second logical volume as a secondary volume	Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data in relation to said first logical volume as a primary volume in said second logical volume as a secondary volume

With respect to claim 44 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>44.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>37.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data in relation to said second logical volume as a primary volume in said first logical volume as a secondary volume	Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data in relation to said second logical volume as a primary volume in said first logical volume as a secondary volume

With respect to claim 45 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>45.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>38.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data sent from said information processing device in said first logical volume as a primary volume and not to store data in relation to said first logical volume in said second logical volume as a secondary volume	Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data sent from said information processing device in said first logical volume as a primary volume and not to store data in relation to said first logical volume in said second logical volume as a secondary volume

With respect to claim 46 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>46.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>39.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data sent from said information processing device in said second logical volume as a primary volume and not to store data in relation to said second logical volume in said first logical volume as a secondary volume	Said change of relationship between said first logical volume and said second logical volume is to change to a state of storing data sent from said information processing device in said second logical volume as a primary volume and not to store data in relation to said second logical volume in said first logical volume as a secondary volume

With respect to claim 47 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>47.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>40.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of restoring data from said first logical volume to said second logical volume	Said change of relationship between said first logical volume and said second logical volume is to change to a state of restoring data from said first logical volume to said second logical volume

With respect to claim 48 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>48.</b> Said first command is used to request a change of relationship between a first logical volume in a Nth storage device and a second logical volume	<b>41.</b> Said first command being used to request a change of relationship between a first logical volume in said second storage device and an second logical volume in said first storage device
Said change of relationship between said first logical volume and said second logical volume is to change to a state of copying data in relation to said first logical volume in said second logical volume	Said change of relationship between said first logical volume and said second logical volume is to change to a state of copying data in relation to said first logical volume in said second logical volume

With respect to claim 49 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
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<b>49.</b> Said first controller or a (N-1)th controller transfers said first command to said Nth storage device based on contents of said first command	<b>42.</b> Said first controller transfers said first command to said second storage device based on contents of said first command
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With respect to claim 50 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>50.</b> Said first controller provides a third logical volume to said information processing device, said third logical volume being used by said information processing device to control said first storage device and	<b>43.</b> Said first controller provides a third logical volume to said information processing device, said third logical volume being used to control said first storage device by said information processing device and
Said first controller transfers said first command to said second storage device based on contents of said first command sent from said information processing device to said third logical volume	Said first controller transfers said command to said second storage device based on contents of said first command sent from said information processing device to said third logical volume

With respect to claim 51 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>51.</b> Said first controller provides a fourth logical volume to said information processing device, said fourth logical volume corresponding to a fifth logical volume in said second storage device and	<b>44.</b> Said first controller provides a fourth logical volume to said information processing device, said fourth logical volume corresponding to a fifth logical volume in said second storage device and
Said first controller transfers said first command to said fifth logical volume if said fourth logical volume is addressed in said first command sent from said information processing device	Said first controller transfers said first command to said fifth logical volume if said fourth logical volume is addressed in said first command sent from said information processing device

With respect to claim 52 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>52.</b> Said first command has information comprising an identification number of said Nth storage device	<b>45.</b> Said first command has information of identification number of said second storage device

With respect to claim 53 of the instant application, please refer to the table below, which illustrates the anticipatory relationship of the claims at issue:

<b><u>Instant Application 10/820,629</u></b>	<b><u>Application 11/087,983</u></b>
<b>53.</b> Said first controller receives a second command, said second command being used to request a condition of a first logical volume from said information processing device to said Nth storage device, and can transfer said second command to said Nth storage device without transferring said second command to said second storage device and	<b>48.</b> Said first controller receives a second command, said second command is used to request a status of said first logical volume from said information processing device to said second storage device, and transferring said second command to said second storage device and
Said Nth controller receives said second command from said first storage device or said (N-1)th storage device and replies with a status of said first logical volume to said information processing device via said first storage device or said (n-1)th storage device in response to said second command	Said second controller receives said second command from said first storage device and replying said a status of said first logical volume to said information processing device via said first storage device in response to said second command

Claims 54 and 57-75 are of the same scope as the claims 32 and 35-53 when the variable N is assigned the value 3. Therefore, claims 54 and 57-75 are rejected for the same reasons as above for claims 37-53.

***Relevant Art Cited By The Examiner***

20. The following prior art made of record and not relied upon is cited to establish the level of skill in the applicant's art and those arts considered reasonably pertinent to applicant's disclosure. See M.P.E.P. 707.05(c).

The following references teach commands for controlling the logical volumes of storage systems.

<b><u>U.S. Patent Number</u></b>	<b><u>Figures</u></b>
6,237,008	2a-2c, 3
6,631,477	2c-2h, 3a, 4a-4f
6,687,718	2-6

***Conclusion***

21. The following is a summary of the treatment and status of all claims in the application as recommended by M.P.E.P. 707.07(i):

- a. Claims 1-31 were cancelled by the amendment dated 20 December 2004.
- b. Per the instant office action, claims 32-75 have received a first action on the merits and are subject of a first action non-final.

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ankur Gogia whose telephone number is 571-272-4166.

The examiner can normally be reached on M-F 8:00am-4:30pm.

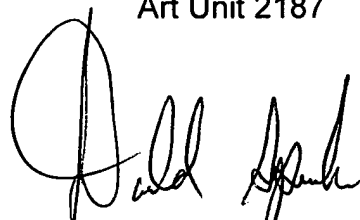
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on 571-272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Ankur Gogia  
Examiner  
Art Unit 2187

9/23/05

  
DONALD SPARKS  
SUPERVISORY PATENT EXAMINER